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RESEARCH ARTICLE - MEDICAL TECHNIQUES

Effect of Covid-19 Vaccine on Women's Fertility Hormones

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Abstract

The coronavirus disease 2019 (COVID-19), as a result of the modern intense respiratory syndrome coronavirus 2, caused an unexpected fundamental global raise in the admission to hospitals for lung and other organ diseases. COVID-19 vaccination has increased and accelerated in a conscionable progress. More than 184 nominee vaccines are being tested in preclinical use and 104 in clinical stages of development. The current study aimed to know the impact of the COVID-19 vaccine on female fertility hormones. The results obtained from the current study showed a slight increase in FSH and LH hormones for women infected with Covid-19 virus and for women who received the vaccine to prevent covid-19 virus compared to healthy, uninfected and unvaccinated groups (FSH 10.26±3.86 ,15.32±2.04 LH 15.41±2.76, 10.40±1.58 respectively), with non-significant differences (P>0.05), while the prolactin hormone levels showed a highly significant increase (P<0.01) in infected women who took the vaccine in comparison with its levels in healthy women who did not receive the vaccine and not infected (32.32±6.48, 19.62±4.04, 10.27±6.88 respectively). Conclusions: Covid- 19 vaccine affected the female hormones in one way or another.

Keywords: Covid-19 vaccine; Female hormone; FSH; LH; Prolactin.

1. Introduction

1.1. Covid-19 disease

The COVID-19 outbreak is the result of uncommon intensive acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which has caused a global unexpected and major increase in hospital admissions for treatment of lung and other organ infections like the digestive organs [1,2]. In mid-November 2002, Covid-19 was identified as SARS for the first time in China and early in 2003, the World Health Organization became aware of the disease and it continued until 2003, spreading around the world, affecting 24 countries in Asia including Cambodia, Hong Kong, Singapore, Hanoi and Canada in North America, and other countries to a lesser extent, causing 8,437 SARS cases and 813 deaths [3]. In December 2019, the global coronavirus disease (COVID-19) was discovered in China in Wuhan Province and Hubei Province, and spread rapidly around the world [4]. In Iraq, the first case of COVID-19 was detected in Najaf Governorate on February 24, 2020, and 4 other cases of the disease were detected in Kirkuk Governorate. In Sulaimaniyah Province, on March 3, 2020, a 69-year-old patient with COVID-19 died from the disease [5]. Coronaviruses are huge, enveloped, single-stranded RNA viruses established in humans and other animals, such as domestic animals (dogs, cats, and cattle) as well as birds like chickens. Covid-19 causes pulmonary, digestive, and nervous system diseases. 229E, OC43, NL63 and HKU1 are the most common coronaviruses in clinical practice, which usually cause common cold signs in an individual with a good immune system. SARS-CoV-2 is the third coronavirus that causes acute infections to humans and spread over the whole world in the last twenty years [6]. SARS-CoV-2 is transmitted firstly through respiratory droplets among individuals who are close to each other. The disease can be transmitted between asymptomatic, pre-symptomatic and symptomatic carriers. The medium time for beginning of symptoms is 5 days after exposure to the virus, and 97.5% of individuals who improve signs and symptoms do so during 12 days. Dry cough, shortness of breath and fever are the general common signs and symptoms of the disease. X-ray and lab. investigation abnormalities, such as a decrease in lymphocyte (lymphopenia) and high lactate dehydrogenase are common, but nonspecific tests [7].

1.2. COVID-19 vaccines

In the pedigree of vaccines, COVID-19 vaccines increased at an un excessive speed. There are 184 nominees vaccines in preclinical expansion, and 104 in clinical stages of development [8]. Recent data reported that there are 18 COVID-19 vaccines approved and are presently in use around the world [9]. There are four primary categories of COVID-19 vaccines using various platforms: (1) whole virus vaccines (2) protein-based vaccines (3) viral vector vaccines and (4) nucleic acid vaccines.

Nomenclature			
Covid-19	Coronavirus disease 2019	PRL	Prolactin
SARSC-2	Severe acute respiratory syndrome coronavirus2	FSH	Follicle-stimulating hormone
SPSS	Statistical Package for the Social Sciences	LH	Luteinizing hormone
229E	Human coronavirus 229E	NL63	Human coronavirus NL63
OC43	Human Coronavirus OC43	HKU1	Human Coronavirus HKU1

1.3. Follicle-stimulating hormone (FSH) and luteinizing hormone (LH)

Are a couple of hormones secreted by the gonadotropic cells of the anterior pituitary gland and regulate the development, growth, puberty maturation and reproductive processes of the body [10].

1.4. Prolactin (PRL)

Also recognized as lactotroph, is a protein well-recognized for its function in enabling mammals to make milk. It is effective in over 300 separate procedures in different vertebrates, including humans [11]. Prolactin is secreted from the anterior pituitary gland and responds to nourishment, mating, estrogen treatment, ovulation and breastfeeding. It is secreted slowly in pulses in between these events. Prolactin plays a main role in metabolism, regulation of the immune system and pancreatic development [12].

2. Patients and Methods

During the period September 2021 to March 2022, samples were taken from three groups of women aged within the reproductive period from 25 years to 45 years old: the first group (40 women) were vaccinated against Covid-19 uninfected, the second group (20 women) were infected with Covid-19, and the third group (25) were healthy, unvaccinated and uninfected in each, from Baghdad and Diyala governorates, 5 ml of venous blood was taken into a plane tube, after separating the serum the measurement of the sex hormone (FSH, LH, and prolactin) for the three groups was carried out using the ELISA technology.

2.1. Statistical analysis

The SPSS statistical program used (t-test) scale to compare the results obtained from all groups.
(Note: Statistical analysis was performed by a clinical biostatistician)

3. Results

Table 1 demonstrated the results of normal and abnormal concentrations of each hormone. The results showed an increase in FSH hormone in the vaccinated group, which is not similar to the result in LH hormone for the same group, and this result may be useful because it is an important indicator which shows the high abnormal level of prolactin among 23 patients of the total number 40 of healthy vaccinated, and among 13 patients of the 20 infected patients with covid-19.

Table 1 Distribution of study results according to the hormones (FSH, LH and Prolactin) (Note: Depending on the number of people who have been studied)

Type of Hormone	Normality		Groups vaccinated and uninfected (G1)	Control (G2) (non-vaccinated and non-infected)	Infected (G3)	t. test
FSH	Normal	No.	26 (65%)	25 (100%)	19 (95%)	P=.000
	Abnormal	No.	14 (35%)	0 (0%)	1 (5%)	MCP<0.01
	Total	No.	40 (100%)	25 (100%)	20 (100%)	(HS)
LH	Normal	No.	32 (80%0	25 (100%)	20 (100%)	P=.011
	Abnormal	No.	8 (20%)	0 (0%)	0 (0%)	MCP≤0.01
	Total	No.	40 (100%)	25 (100%)	20 (100%)	(S)
Prolactin	Normal	No.	17 (42.5%)	21 (84%)	7 (35%)	P=.000
	Abnormal	No.	23 (57.5%)	4 (16%)	13 (65%)	MCP<0.01
	Total	No.	40 (100%)	25 (100%)	20 (100%)	(HS)

Table 2 and Fig. 1 showed the mean FSH hormone level for healthy women as a control non-receiving vaccine and healthy women vaccinated and women infected with covid -19. The highest level of FSH hormone was among Healthy vaccinated (15.32±20.04), followed by infected women (10.26±3.86) then low levels among healthy non vaccinated and non-infected (7.89±2.71).
Table 3 and Fig. 2 revealed the mean LH hormone level among healthy women as a control non receiving the vaccine and healthy women vaccinated and women infected with covid -19. The highest level of LH hormone was among Covid -19 Patients (15.41±12.76) followed by Healthy Vaccinated women (10.40±10.58) then low level among healthy non-vaccinated and non-infected (10.27±6.88).

Table 2 Comparison between COVID-19 Patients and Control group according to the level of Follicle Stimulating Hormone (FSH) (mlu\ml)

Groups	(Mean± Std.)	Compared with control		Compared COVID-19 Patients	
		t-test	P-Value	t-test	P-Value
Healthy Non-Vaccinated (Control)	7.89±2.71				
Healthy Vaccinated	15.32±2.04	1.838	.071(P>0.05 NS)		
COVID-19 Patients	10.26±3.86	2.413	.020(P<0.05 S)	1.116	.269(P>0.05 NS)

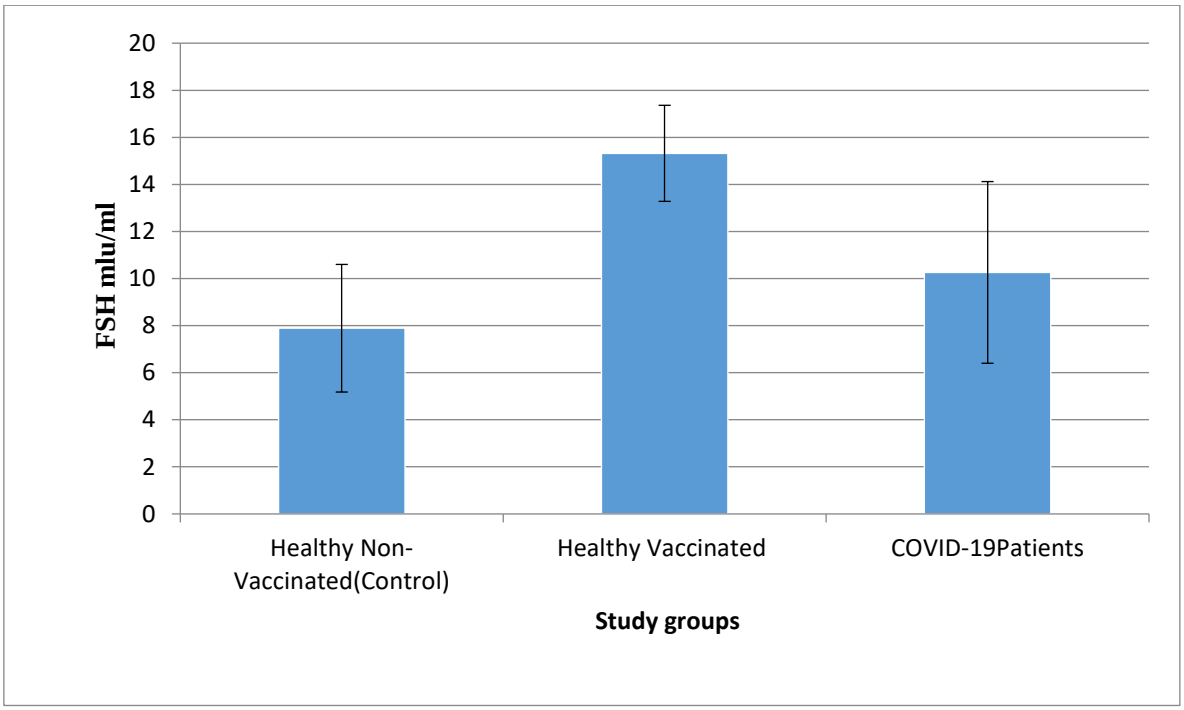

Fig 1. Comparison between COVID-19Patients and Control group according to level of Follicle Stimulating Hormone (FSH) (mlu\ml)

Table 3 Comparison between COVID-19 Patients and Control groups according to the level of Luteinizing Hormone (LH) (mlu\ml)

Groups	(Mean± Std.)	Compared with control		Compared with COVID-19 Patients	
		t-test	P-Value	t-test	P-Value
Healthy Non-Vaccinated (Control)	10.27±6.88				
Healthy Vaccinated	10.40±1.58	0.056	.955(P>0.05 NS)		
COVID-19 Patients	15.41±2.76	1.730	.091(P>0.05 NS)	1.614	.112(P>0.05 NS)

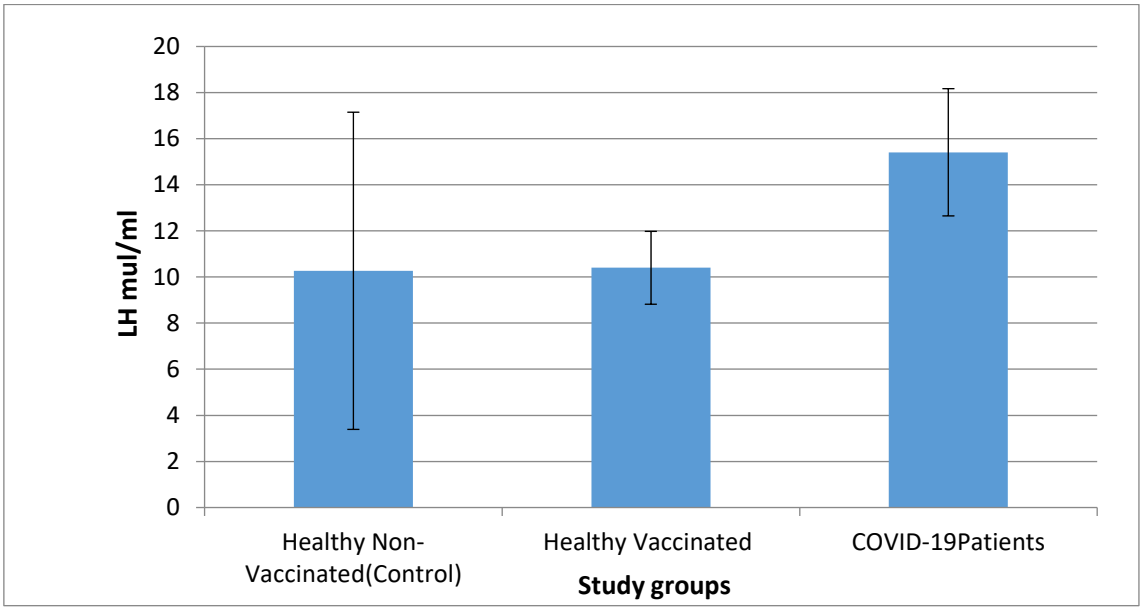

Fig 2. Comparison between COVID-19 Patients and Control group according to level of Lutenizing Hormone (LH) (mlu\ml)

Table 4 and Fig. 3 showed the mean Prolactin hormone level among healthy women as a control non-receiving the vaccine and healthy women vaccinated and women infected with covid-19. The highest level of prolactin hormone was among Healthy Vaccinated women (32.32±36.48) followed by Covid -19 Patients (19.62±4.04) then low level among healthy non- vaccinated and non-infected (10.27±6.88).

Table 4 Comparison between COVID-19 Patients and Control group according to level of Prolactin (ng\ml)

Groups	(Mean± Std.)	Compared with control		Compared COVID-19 Patients	
		t-test	P-Value	t-test	P-Value
Healthy Non-Vaccinated (Control)	10.27±6.88				
Healthy Vaccinated	32.32±6.48	2.981	.004(P<0.01 HS)		
COVID-19 Patients	19.62±4.04	5.375	.000(P<0.01 HS)	1.546	.128(P>0.05 NS)

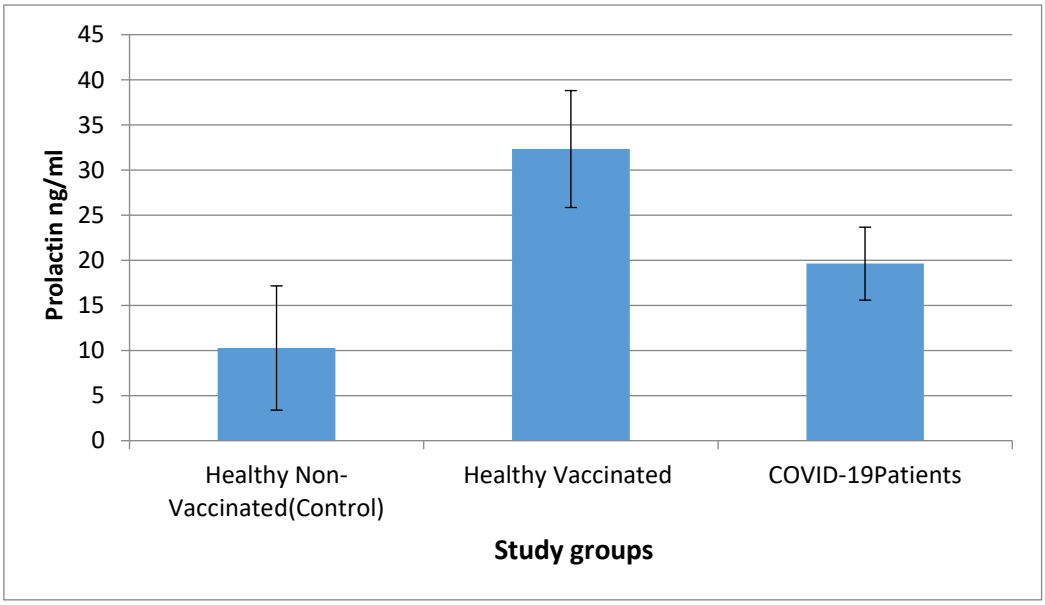

Fig 3. Comparison between COVID-19Patients and Control groups according to level of Prolactin (ng\ml)

4. Discussion

COVID-19 shows an impendence on the genital systems of both men and women [13]. The existence of SARS-CoV-2 in the genital system of the women (vagina and placenta) underlies the failure of female fertility [13]. It is not known when this pandemic will end for this reason and there are more questions related to the female reproductive system, especially issues related to fertility. This study aims to clarify the probable relationship between COVID-19 and female fertility. This paper assures the influence of SARS-CoV-2 on female hormones, endometrial tissue, menstrual period and other fertility-related factors such as ovarian impound, follicular fluid, oocytes and fetuses. The extracted results from this study showed that endometrial samples did not indicate the presence of SARS-CoV-2 RNA. As for the menstrual period, there are significant changes, including increased levels of follicle-stimulating hormone (FSH) [14].

It was speculated that SARS-CoV-2 may infect the female reproductive system (ovary, uterus and vagina) through the extensive expression of angiotensin-converting enzyme 2 (ACE2), thereby disturbing the female reproductive functions and leading to infertility and menstrual disorders [15].

This study investigated the effect of covid-19 virus and its vaccine on the level of female sex hormones (FSH, LH and prolactin). The results obtained from the current study showed that most of the women from whom samples were taken, especially those vaccinated against the virus and those infected with the virus, showed an increase in the hormone prolactin in particular as seen in Table 1. The hormones FSH and LH were increased slightly among women who were infected with the virus "Covid-19" or women who were given doses of the vaccine that were taken to prevent the virus "Covid 19." In comparison with healthy groups who were not infected and not vaccinated who recorded (FSH 10.26±3.86 ,15.32±2.04, LH 15.41±2.76, 10.40±1.58 respectively) with a non-significant difference as shown in Table 2&3 and Fig. 1&2.

These results were in agreement with the result of Li, K et.al. 2021, who showed an increase in the levels of FSH and LH among some studied women [16]. In a study conducted from April to September 2020, one thousand patients who underwent in vitro fertilization and 997 patients with pre-pandemic covid-19, the FSH levels were shown to be higher (the majority of women had the FSH in the upper two quartiles) at the beginning of the period in comparison to the levels before the pandemic [17]. However, the results showed a highly significant increase in the levels of prolactin hormone among infected women and among those who took the vaccine when compared with the healthy women who did not receive the vaccine and not infected (32.32±36.48 19.62±4.04, 10.27±6.88 respectively) as illustrated in Table 4 and Fig. 3.

In the study conducted by Ding et al. (2021), they showed different results in the hormonal ovarian condition status. A total of (78) SARS-CoV-2 positive females were registered in their study, and the patients with ovarian pathologies or surgeries were excluded. The major results were: a decrease in anti-mullerian hormone (AMH) levels, an increase in FSH levels, and high levels of testosterone and prolactin in women among the COVID-19 group, when compared with the age-matched control group [18].

It was concluded from this study that the Covid-19 vaccine has an effect on female hormones in one way or another, and it is not known whether this effect continues or not, thus further studies are needed to confirm the results more.

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